Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Fiziologija rastlin
Course title:	Plant Physiology

Študijski program in stopnja **Study programme and level**	**Študijska smer** **Study field**	**Letnik** **Academic year**	**Semester** **Semester**
Univerzitetni študijski program Ekologija z Naravovarstvom, 1. stopnja	/	3	6
Undergraduate university programme Ecology with Nature Conservation, 1st degree	/	3	6

Vrsta predmeta / Course type Obvezni/Compulsory

Univerzitetna koda predmeta / University course code:

Predavanja **Lectures**	**Seminar** **Seminar**	**Vaje** **Tutorial**	**Klinične vaje** **work**	**Druge oblike študija**	**Samost. delo** **Individ. work**	**ECTS**
45		**30**			**105**	**6**

Nosilec predmeta / Lecturer: Jana Ambrožič-Dolinšek

Jeziki / Languages:	
Predavanja / Lectures:	Slovenski / Slovenian
Vaje / Tutorial:	Slovenski / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Vsaka izmed naštetih obveznosti v načinih ocenjevanja mora biti opravljena s pozitivno oceno. Opravljeno laboratorijsko delo in poročilo sta pogoj za pristop k pisnemu izpitu.	Each of the mentioned commitments must be assessed with a passing grade. Passing grades of laboratory work, and report are required for taking the written exam.

Vsebina: **Content (Syllabus outline):**

Predmet obravnava fiziološke procese v rastlinah, rast in razvoj ter prilagojenost rastlin na okolje. Poudarek je na medsebojni povezanosti zgradbe in delovanja rastlin od nivoja molekul do nivoja cele rastline. Predmet v prvem delu obravnava vodne razmere v rastlini, mehanizme sprejema, prenosa in premeščanja vode, ionov in raztopin, mineralno prehrano ter lastnosti membran in membranske procese. V drugem delu obravnava energetske pretvorbe, metabolizem ogljika, fotosintezo, premeščanje asimilatov, dihanje, metabolizem dušika in žvepla ter sekundarni metabolizem rastlin. Fotosinteza kot osnovni proces pridobivanja čiste, obnovljive in trajnostne energije. Pomen fotosinteze v zeleni in trajnostni infrastrukturi. V tretjem delu obravnava rast in razvoj rastlin, biosintezo celične stene, hormonalno regulacijo, vplive zunanjih dejavnikov na rast in razvoj, zaznavanje in odzivanje na dražljaje iz okolja, cvetenje, embriogenezo, nastanek semen in plodov, kalitev semen, staranje in gibanja rastlin.	The course introduces the physiological processes of plants, the growth, development and adaptations of plants to the environment. The focus is on the relationship between structure and function, from the molecular to the whole plant level. The first part deals with the water relations of plants, the uptake, transport and translocation mechanisms of water, ions and solutes, mineral nutrition, membrane properties and processes. The second part deals with energy conversion, photosynthesis, carbon metabolism, the translocation of assimilates, respiration, nitrogen and sulfur metabolism and secondary metabolism in plants. Photosynthesis as a basic process for clean, renewable and sustainable energy. The importance of photosynthesis in green and sustainable infrastructure. The third part deals with the growth and development of plants, the biosynthesis of cell walls, hormonal regulation, the influence of external factors on growth and development, the perception of and responding to environmental stimuli, flowering, embryogenesis, the development of seeds and fruits, the germination of seeds, senescence and plant movements.

Temeljni literatura in viri / Readings:

Temeljna literatura / Basic literature:

Vodnik, D. (2012). *Osnove fiziologije rastlin* (str. 141). Oddelek za agronomijo, Biotehniška fakulteta.

Taiz, L., & Zeiger, E. (1998, 2002). *Plant physiology* (2nd,3rd ed., str. XXVI, 690). Sinauer Associates.

Priporočena literatura / Recommended readings:

Bresinsky, A. (2013). *Strasburger's plant sciences: including prokaryotes and fungi* (str. 2 zv. (1302)). Springer. http://dx.doi.org/10.1007/978-3-642-15518-5

Hopkins, W. G. (1999). *Introduction to plant physiology* (2nd ed., str. XV, 512 , 4 pril.). Wiley.

Taiz, L., & Zeiger, E. (2010). *Plant physiology* (5th ed., str. XXXIV, 782 , 137 pril.). Sinauer Associates.

Plant physiology and development (6th, 7th ed., str. XXVII, 752, 84). (2018, 2023). Oxford University Press.

Sitte, P. (2002). *Lehrbuch der Botanik: für Hochschulen: begründet von E. Strasburger ... [et al.]* (35. Aufl., str. XIV, 1123). Spektrum Akademischer Verlag.

Izbrani članki iz znanstvenih revij / Selected papers from scientific journals.

Cilji in kompetence:

- Seznaniti študente s fiziološkimi procesi, metabolizmom, vodnimi razmerami, prehrano in transportom v rastlinah, rastjo in razvojem ter prilagojenostjo rastlin na okolje.
- Usposobiti študente za prepoznavanje procesov in mehanizmov, ki vodijo v prilagajanje rastlin na spremembe v okolju.
- Seznaniti študente z biotskimi in abiotskimi dejavniki, ki vplivajo na rastline.
- Usposobiti študente za prepoznavanje in razumevanje fizioloških procesov in mehanizmov na vseh ravneh organizacije rastlinskega telesa, na celični, morfološki, biokemijski, molekularni ravni.
- Ovrednotiti fotosintezo kot osnovni proces za proizvodnjo čiste, obnovljive in trajnostne energije.
- Ovrednotiti pomen fotosinteze za zeleno in trajnostno infrastrukturo.
- Praktično usposobiti študente za raziskovalno delo z rastlinskim materialom.

Objectives and competences:

- Introduction to physiological processes, metabolism, water balance, nutrition and transport in plants, growth and development as well as the adaptation of plants to their environment.
- Students should be able to recognize the processes and mechanisms that lead to the adaptation of plants to changes in the environment.
- To familiarize students with the biotic and abiotic factors that influence plants.
- Students should be able to recognize and understand physiological processes and mechanisms at all levels of the organization of the plant body - cellular, morphological, biochemical and molecular.
- Evaluate photosynthesis as a basic process for clean, renewable and sustainable energy production.
- Evaluate the importance of photosynthesis in green and sustainable infrastructure.
- Practical training of students in research work with plant material.

Predvideni študijski rezultati:

- Razume in ovrednoti osnovne fiziološke procese, pomembne za rastline
- Razume in ovrednoti fiziološke procese in mehanizme, ki vodijo v prilagajanje rastlin v spreminjajočem okolju.
- Prepozna biotske in abiotske dejavnike, ki vplivajo na rastline.
- Ovrednoti pomen fotosinteze kot proces pridobivanja čiste, obnovljive in trajnostne energije in njen pomen v zeleni in trajnostni infrastrukturi.
- Osvoji spretnosti, pomembne za praktično eksperimentalno delo:

Intended learning outcomes:

- Understanding and evaluating basic physiological processes relevant to plants
- Understand and evaluate physiological processes and mechanisms that lead to the adaptation of plants to a changing environment.
- Recognize the biotic and abiotic factors that influence plants.
- Evaluate the importance of photosynthesis as a process for clean, renewable and sustainable energy production and its role in green and sustainable infrastructure.

opazovanje, merjenje, ravnanje z rastlinskim materialom, kemikalijami, steklovino, osnovnimi aparaturami, zbiranjem rezultatov, načrtovanjem poskusov, vrednotenjem rezultatov, poročanjem. - Osvoji izbrane laboratorijske metode ter se usposobi za delo z rastlinskim materialom. - Se usposobi za varno delo v laboratoriju.	- Acquire skills that are important for practical experimental work: Observation, measurement, handling plant material, chemicals, glassware, basic apparatus, collecting results, planning experiments, evaluating results, reporting. - Learning selected laboratory methods and training in working with plant material. - Learn how to work safely in the laboratory.

Metode poučevanja in učenja:	**Learning and teaching methods:**
- Predavanja - Laboratorijske vaje	- Lectures - Laboratory exercises

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
- Pisni izpit	50	- Written exam
- Laboratorijsko delo	38	- Laboratory work
- Poročilo	12	- Report

Opombe:
Laboratorijsko delo vključuje kolokvij po zaključenih vajah.
Comments:
The laboratory work includes a colloquium after the exercises.

Reference nosilca / Lecturer's references:

Ambrožič-Dolinšek, J., Podgrajšek, A., Šabeder, N., Mazej, Z., Urbanek Krajnc, A., Todorović, B., & Ciringer, T. (2023). The potential of berula erecta in vitro for As bioaccumulation and phytoremediation of water environments. *Environmental pollutants & bioavailability*, *35*(1, [ ] 2205010), 12. https://dk.um.si/IzpisGradiva.php?id=84870

Grujić, J. V., Todorović, B., Kranvogl, R., Ciringer, T., & Ambrožič-Dolinšek, J. (2022). Diversity and content of carotenoids and other pigments in the transition from the green to the red stage of Haematococcus pluvialis microalgae identified by HPLC-DAD and LC-QTOF-MS. *Plants*, *11*(8), 14. https://dk.um.si/IzpisGradiva.php?id=88637

Ambrožič-Dolinšek, J., Ornik, D., Branda, R., Molnar, Z., & Ciringer, T. (2021). Does biostimulant Agrostemin® exhibit plant growth regulator activities? *Phyton*, *61*, 109–116. doi:10.12905/0380.phyton61-2022-0109